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ABSTRACT

This publication is a guide to the biome research conducted under the International Biological Program. The guide lists biome researchers by interest and by biome as well as a central list. A site list, map, information sources section reporting abstracts, bibliographies, journals, books, evaluations, and data books are also included. Three appendices give additional information especially on biome data sets. The biome researchers directory portion of this guide lists many biome researchers, giving their 1977 addresses and telephone numbers, and indicating the biome they studied and their special interest. The information sources section on published and unpublished bibliography sources includes descriptions of available materials and contacts to facilitate their acquisition. This guide may also be useful to natural and social scientists working on problems of environmental assessment and to those persons involved in natural resource management. (HR)

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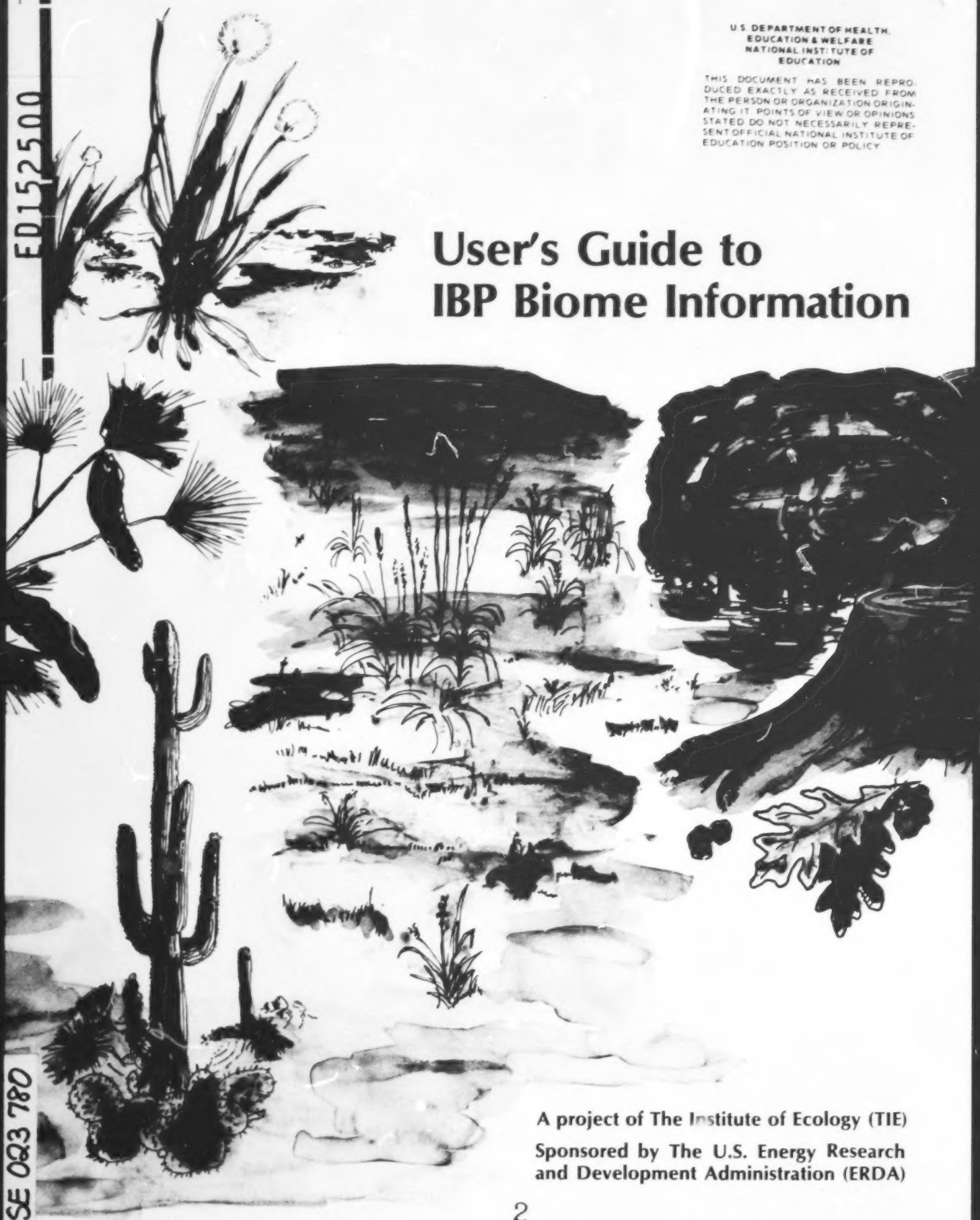

A project of The Institute of Ecology (TIE)

Sponsored by The U.S. Energy Research and Development Administration (ERDA)

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USER'S GUIDE

TO BIOME INFORMATION

From The United States International Biological Program (IBP)

First Edition
August 1977

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A Project of
The Institute of Ecology (TIE)
Sponsored by
The U.S. Energy Research and Development Administration (ERDA)

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Preface

TIE's Access Project had its origin in a March 1974 meeting organized by Dr. Beatrice Willard, then a member of the President's Council on Environmental Quality (CEQ) and now with the Colorado School of Mines. The meeting was attended by representatives of 26 agencies and sought to demonstrate how biome information could be used in the preparation of impact statements. Presentations of data, models, and potential applications were given by Dr. George Van Dyne (Grassland Biome), Dr. Jerry Brown (Tundra), Dr. Fred Wagner (Desert), Drs. Dale Cole and Stanley Gessel (Coniferous Forest) and Dr. Robert Burgess (Eastern Deciduous Forest).

On November 25, 1974, a meeting was convened by Dr. Lee M. Talbot of CEQ in collaboration with the Association of Systematics Collections (ASC), The Institute of Ecology (TIE), and the Environmental Information System Office (EISO) of Oak Ridge National Laboratory (Edwards and Grotta, 1975). The meeting served as a forum for the exchange of information on needs for, and sources of, ecological and systematic facts, data, and opinions. Sixteen federal agencies were represented, with TIE and ASC speaking for biological researchers at universities, laboratories, and museums.

Much of the discussion was within the context of NEPA (the National Environmental Policy Act). Dr. Talbot and many other speakers emphasized the need for improved use of biological information in the preparation of the environmental impact statements required under NEPA. The scope and limits of nonfederal information sources, and the problems of transferring information from such sources to federal users, were also recognized and discussed.

The Access concept was further developed by an Advisory Committee on Data Exchange chaired by Nancy Ferguson, now with the University of Arizona (Loucks and McElreath, 1975.) They focused on national ecological data sources, especially those developed through the biome studies of the International Biological Program. They discussed such transfer systems as a data abstracts series, an ecological data handbook, and regional data centers.

On May 22, 1975, TIE submitted, to the U.S. Energy Research and Development Administration (ERDA), a proposal entitled "Improving ERDA's Access to Environmental Assessment Expertise and Data." After negotiation with ERDA, a contract was awarded (effective July 1, 1976) to TIE with the specific objectives of inventorying the data collected during IBP, and making the data more readily available to potential users.

These objectives were accomplished in two phases. During phase I, Peter Haug visited each center and interviewed key personnel, using a checklist designed to cover four broad questions:

—What information do the biome informaton centers have?
—Who are potential users of this information?
—How accessible is this information?
—What will the information cost to get?

His interim report (January 10, 1977) included a methods section, a review of pertinent literature, results, and recommendations, as well as summaries of each biome interview. In this guide, Appendix B is the tabular summary of results from Haug's survey report.

The survey phase was organized, guided and evaluated by the project Steering Committee which held three meetings: Logan, Utah, August 17-18, 1976; Oak Ridge National Laboratory, Oak Ridge, Tennessee, October 26-27, 1976; and Ft. Collins, Colorado, February 8-11, 1977.

The project's phase II was devoted to preparation of this guide, with potential users being involved in both specification and review of contents. A workshop at Argonne National Laboratory, March 22-23, 1977, brought together biome specialists, EIS writers and consulting ecologists, all of whom made useful contributions to the preparation process.

Serving as Project Manager and liaison to ERDA, Dexter Hinckley has been responsible for the overall management of the project as well as the editing, production, and distribution of the guide.

Acknowledgments

First of all, we would like to thank the directors, the information specialists and the working advisory committees in each biome for their fine cooperation. We especially appreciate the help of those who represented their biomes at meetings of the Steering Committee that guided this project. These include: Dr. Dale Johnson and Dr. Phillip Sollins from the Coniferous Biome; Dr. Ben Norton, Dr. Charles Romesburg and Ms. Vicki Shinn from the Desert Biome; Mr. Charles Van Baker from the Glassland Biome; Dr. Robert Burgess and Ms. Julie Watts from the Eastern Deciduous Forest Biome; and Dr. Larry Underwood from the Tundra Biome.

We would also like to acknowledge the invaluable assistance provided by Dr. Edwin Pentecost who served as host for the workshop at Argonne National Laboratory. Finally, Dorothy Hessong, Monica Hinckley, Ann Matikan, Jack Smith and Mary Yenchick deserve both credit and commendation for their excellent work in producing this report.

A.D.H. and P.T.H.

Introduction

For nearly two decades—since "1959 when discussions began on the feasibility of an international program of biological studies concerned with problems of productivity, man, and environment" (NRC 1974, p. 1)—biological scientists throughout the world have wrestled more and more with the problems of man in the global ecosystem. Much of this effort was focused, beginning in 1964, on organizing and conducting research under the International Biological Program (IBP). In the United States, the overall goals "included advancing the basic sciences related to resource management, furthering training, and developing international exchanges of results of research" (NRC 1974, p. 1).

The US/ IBP major efforts ran from 1967 through 1974, with some final data analysis and synthesis continuing into 1977. Programs were divided into two components: environmental management and human adaptability. Within the environmental management component, ecosystems at more than 36 research sites in five biomes were studied with varying intensity under funding largely from the National Science Foundation (NSF). These biome studies (analysis of ecosystems) were designed around two innovative concepts: the application of systems analysis techniques to ecosystem-level ecology and the unification of terrestrial and fresh-water productivity research.

The goals of the biome studies evolved as the procedures for implementing integrated programs developed. They were initially stated as follows:

—To understand how ecological systems operate

—To investigate relationships between adjacent land and water systems within watersheds

—To improve estimates of potential plant and animal production in the major regions of the United States as a national contribution to the worldwide goals of the IBP

—To add to the scientific basis of resource management as a means of maintaining or improving the quality of the environment.

Although the biome studies will terminate officially during 1977, publications based on biome research will continue to appear for years to come. These will include journal papers, sections in texts, reviews, and synthesis volumes. Many of the researchers who worked in the analysis of ecosystems program will be involved in further investigations at the ecosystem level (Johnson, 1977). This guide should help ecosystem researchers continue the traditions of cooperation and information-sharing that have characterized IBP's efforts in the United States and in other nations.

The natural and social scientists working on problems of environmental assessment should also find this guide a valuable introduction to biome studies. It will help them locate base-line information, obtain relevant references, and contact experts who can help analyze potential impacts of technology. The guide is not, however, a compendium of biome information. It simply helps users locate sources of such information.

Outline of The Guide

Biome Researchers
- Main list
- By biome
- By interest

Site List

Map

Information Sources
- Abstracts
- Bibliographies
- Journals
- Books
- Evaluations
- Data Banks

Appendices
- A. Glossary
- B. Biome Survey Results
- C. Data Set Documentation Forms

Suggestions For Use of the Guide

The central section of the guide is a map of the United States, showing approximate boundaries delineating the major biomes. The locations of 36 research sites are also marked on the map. It should be noted that specific sites reflect vertical zonation not shown by the boundary lines. For example, Pawnee (grasslands), Cache la Poudre River (coniferous), and Niwot Ridge (tundra), are all biome sites at different altitudes in Colorado.

The 36 sites with numbered locations on the map are listed, indicating those designated as principal (or intensive) sites. Selected information on precipitation and vegetation is also presented.

The directory portion of the guide lists many, but not all, biome researchers, giving their 1977 addresses and phone numbers, and indicating the biome they studied and their special interest (e.g., plants-terrestrial). Index lists are arranged by biome and interest. These researchers are generally university professors with full loads of teaching, research, and other activities. Therefore, any requests for biome information directed to them should be reasonable. Anything more extensive than a quick answer on the telephone may require some consultative arrangement.

The section on published and unpublished bibliographic sources includes descriptions of available abstracts series, bibliographies, journals, books, evaluations and data banks. Contacts are given to facilitate acquisition of key materials.

Three appendices give additional information, especially on biome data sets.

In using the guide, common sense should prevail. If the user is interested in general land use planning for an entire region of the United States, he may find applicable information available at many sources in one or more biomes. However, a user focusing on the specific impacts of a power plant would have to be very cautious in applying information obtained at research sites in the same biome. The limits of transferability should be recognized in any attempted use of scientific information. This even applies to the use of a consultant whose experience may not always be appropriate for an accurate evaluation of ecosystem data on a site where he has had no research experience.

It may be helpful to consider a specific example of possible use. If a student wanted information on primary productivity, he would obtain, and search, abstracts, bibliographies or journals. If he wanted to contact a researcher who had studied primary productivity in the tundra biome, he would start with some of those on the tundra biome affiliation list identified by the codes pl.-t. (plants-terrestrial) or pl.-a. (plants-aquatic). For the student with an interest in primary productivity throughout all five biomes, the subject area lists should provide names of those with the appropriate botanical and ecological expertise. Finally, he would find useful reviews on primary productivity in symposia or synthesis volumes.

REFERENCES

Edwards, Stephen R. and Leonard D. Grotta (Editors). 1975. Taxonomic and Ecological Services: Underdeveloped Resources. Association of Systematics Collections, Lawrence, Kansas. 52 pp.

Loucks, Orie L. and Nancy McElreath. 1975. A Position Paper on National Ecological Data Resources. TIE Committee on Ecosystem Studies, Madison, Wisconsin. 22 pp.

Johnson, Philip L. (Editor). 1977. An Ecosystem Paradigm for Ecology, Oak Ridge Associated Universities. 20 pp.

National Research Council (NRC). 1974. U.S. Participation in the International Biological Program—Report No. 6 of the U.S. National Committee for the International Biological Program. National Academy of Sciences, Washington, D. C. 166 pp.

Directory of Biome Researchers

This list includes some researchers from each biome. It is intended to cover the major subject areas investigated in each biome. However, many researchers who participated actively in the biome studies are not included in this edition.

Abbreviations

C—Coniferous Forest Biome
D—Desert Biome
E—Eastern Deciduous Forest Biome
G—Grassland Biome
T—Tundra Biome
pl.—plants
an.—animals
a—aquatic
t—terrestrial
decomp.—decomposers
bio. proc.—biological processes
nutr.—nutrients, cycling and soils
phys. proc.—physical processes
mod.—modeling
reg. an.—regional analysis
info.—information
site ad.—site administration

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Clebsch	pl.-t.
Cleseeri, L.	decomp.
Cleseeri, N.	site ad., nutr.
Cooper	mod.
Cornaby	nutr., decomp.
Cottam	reg. an., pl.-t.
Cromack	decomp., nutr., reg. an.
Crossley	site ad., an.-t.
Dinger	plants
Douglass	phys. p.
Dueser	an.-t.
Dunn	pl.-t.
Edwards, N.	decomp., nutr.
Ek	mod., reg. an.
Elwood	phys. p., an.-a.
Ensign	decomp.
Ferguson	info.
Ferris, J. J.	decomp.-a. nutr.
Ferris, J. M.	an.-t., decomp.
Franz	pl.-t.
George	an.-a.
Harris, W.	site ad., pl.-t.
Hasler	an.-a.
Hellmers	pl.-t.
Hett	reg. an.
Hilsenhoff	an.-a.
Howard	pl.-a.
Hunter	decomp.
Hutchinson	phys. p.
Johnson, W.	pl.-t., reg. an.
Jorgenson, J.	nutr., decomp.
Keeney	nutr.
Kercher	mod.
Kinnerson	pl.-t.
Kitchell	an.-a.
Knoerr	site ad., phys. p.
Kobayashi	nutr.
Koonce	pl.-a., mod.
LaRoe	an.-a.
Loucks	site ad., mod.
McBrayer	an.-t., decomp.
McCracken	pl.-a.
McNaught	an.-a.
Magnuson	an.-a.
Metz	decomp.
Monk	site ad., pl.-t.
Olson	mod.
O'Neill	mod.
Park	mod.
Perrotte	an.-a.
Petty	pl.-t.
Ralston	pl.-t.
Randolph	an.-t.
Reichle	site ad., an.-t., decomp.
Schreuder	pl.-t., nutr.
Shugart	mod.
Sollins	mod.
Stearns	reg. an.
Sterling	info.
Stone	pl.-an.
Strain	site ad., pl.-t.
Strand, R. H.	info.
Stross	bio. p.
Swark	pl.-t.
Swindel	nutr.
Titus	pl.-a.
Van Hook	an.-t.
Van Winkle	mod.
Waide	mod.
Watts	info.
Wells	nutr.
Wilkinson	mod.
Williams, E.	an.-t.
Wuenscher	pl.-t.

GRASSLAND

Andrews	an.-t.
Angel	decomp.
Baker	info.
Baldwin	an.-t.
Bartos	pl.-t.
Baugh	decomp.
Begg	pl.-t.
Beidleman	pl.-t.
Bell	an.-t.
Birney	an.-t.
Bledsoe, L. J.	nutr., mod.
Blocker	an.-t.
Bokhari	pl.-t.
Botkin	mod.
Burcham	pl.-t.
Burdick	an.-t.
Caldwell	pl.-t.
Carlson	info.
Christensen	decomp.
Clark	nutr., decomp.
Coleman	an.-t., decomp.
Collins, D.	site ad., pl.-t.
Cringan	an.-t.
Crossley	an.-t.
Delwiche	nutr.
Detling	mod., bio. p., pl.-t.
Dix	pl.-t.
Dodd	site ad., pl.-t.
Doxtader	decomp.
Duncan	site ad., pl.-t.
Dyer	an.-t.
Ellis	an.-t.
Fisher	pl.-t.
Franklin, W.	nutr., phys. p.
French	an.-t.
Garland	decomp.
Gerdemann	decomp.
Gibson	Dir.
Golley	an.-t.
Graul	an.-t.
Hansen	an.-t.
Harris, J.	decomp.
Harris, L.	decomp., an.-t., mod.
Haug	mod.
Heady	pl.-t.
Hein	phys. proc.
Herbel	pl.-t.
Herrmann, S.	pl.-a., an.-a.
Hoffman	an.-t.
Huddleston	site ad., an.-t.
Hulett	pl.-t.
Hunt	decomp., mod.
Hutcheson	pl.-t.
Innis	mod.
Jain	pl.-t.
Jameson	site ad.
Johnston	an.-t.
Jones	pl.-t.
Kadlec	an.-t.
Kanemasu	phys. p.
Kennedy	pl.-t.
Klein	decomp.
Knievel	pl.-t.
Knight	pl.-t.
Kucera	decomp.
Lauenroth	pl.-t.
Lavelle	phys. p.
Lavigne	an.-t.
Lewis	site ad., pl.-t.
Likens	nutr.
Lloyd	an.-t.
McClellan	decomp.
McColl	pl.-t.
McDaniel	an-t.
Marshall	pl.-t.
Menke	pl.-t.
Miller, L.	pl.-t.
Mitchell, J.	an.-t.
Morris	pl.-t., site ad.
O'Farrell	site ad., an.-t.
Paris	an.-t.
Parton	phys. proc., mod.
Patten	mod.
Pengra	decomp.
Pettit	nutr., pl.-t.
Pieper	site ad., pl.-t.
Price	phys.
Raguse	pl.-t.
Raitt	an.-t.
Reuss	mod., nutr.
Rice	an.-t.
Rickard	pl.-t., site ad.
Risser	pl.-t., site ad.
Ryder	an.
Sauer	pl.-t., mod.
Schwartz	an.-t.
Scott	an.-t.
Shoop	site ad.
Sims	an.-t.
Smith, F.	phys. p., mod.
Staffeldt	decomp., nutr.
Stanton	decomp.
Swartzman	mod.
Swift	an.-t., mod.
Thayer	decomp.
Tomanek	pl.-t., site ad.
Trappe	phys. p., bio. p., nutr.
Trlica	pl.-t.
Ueckert	an.-t.
Van Dyne	pl.-t.
Wallace, J.	an.-t.
Ward	pl.-t. site ad.
Watt	mod.
Weaver	pl.-t., site ad.
Whicker	phys. p., nutr.
Whitman	pl.-t., site ad.
Wicklow	decomp.
Wiegert	mod.
Wiens	an.-t.
Williams, W.	pl.-t.
Woodmansee	nutr.
Wunder	mod.
Young	pl.-t.

Alexander	decomp., nutr.
Alessio	pl.-t.
Anderson, J.	plants
Arkley	decomp.
Banks	an.-t.
Barsdate	decomp., nutr.
Benoit	decomp.
Billings	pl.-t.
Bonde	pl.-t.
Bridges	mod.
Brown	Dir., phys. p., info.
Bunnele	mod.
Cade	an.-t.
Caldwell	pl.-t.
Cameron	plants, decomp.
Chapin	pl.-t., nutr.
Collier	ar. mals, mod.
Collins, N. J.	pl.-t.
Crossley	an.-t.
Dean	mod.
Dennis	pl.-t.
DeWolfe	an.-t.
Dodson	an.-a.
Edwards, J.	an.-t.
Everett	decomp., nutr.
Feist	an.-t.
Flanagan	decomp.
Gersper	decomp.
Green	mod.
Haugen	phys. p.
Hobbie	decomp.
Ives	phys. p.
Johnson, A.	pl.-t.
Kangas	aquatic
Luick	an.-t.
McLean	an.-t.
McRoy	pl.-a., nutr.
Miller, M.	an.-a., pl.-a.
Miller, O.	decomp.
Miller, P.	mod.
Mitchell, W.	pl.-t.
Oechel	pl.-t.
Packer	pl.-t.
Pitelka	an.-t.
Rastorfer	pl.-t.
Rickard	pl., site ad.
Ruldolph	pl.-t.
Scarborough	decomp.
Smart	an.-t.
Stonley	pl.-a.
Stross	bio. p.
Tieszen	pl.-t.
Underwood	info., an.-t.
Van Cleve	reg. an., decomp.
Webber	pl.-t.
West, G.G.	an.-t., info.
White, C.M.	an.-t.
White, R.G.	an.-t.

SUBJECT Area Lists

Terrestrial Plants

Allessio	T
Balda	D
Bamberg	D
Bartlett	D
Bartos	G
Beatley	D
Begg	G
Beidleman	G
Billings	T
Bokhari	G
Bonde	T
Burcham	G
Caldwell	D,G,T
Chapin	T
Clebsch	E
Collins, D.	G
Collins, N.	T
Gottam	E
Cunningham	D
DelMoral	C
Dennis	T
Detling	G
Dix	G
Dodd	G
Duncan	G
Dunn	E
Dyrness	C
Fisser	G
Franklin, J.	C
Franz	E
Gessel	C
Harris, W.	E
Heady	G
Hellmers	E
Herbel	G
Hermann	G
Hironaka	D
Holte	D
Hulett	G
Hutcheson	G
Jain	G
Johnson, A.	T
Johnson, H.	D
Johnson, W.	E
Jones	G
Kennedy	G
Kinnerson	E
Knievel	G
Knight	G
Lauenroth	G
Lewis	G
Lloyd	G
Ludwig	D
McColl	G
MacMahon	D
Marshall	G
Menke	G
Miller, L.	G
Mitchell, W.	T
Monk	E
Morris	G
Nash	D
Nisbet	D
Oechel	T
Packer	T
Patten, D.	D
Pearson	D
Pettit	G
Petty	E
Pieper	G
Pike	C
Raguse	G
Ralston	E
Rastorfer	T
Rickard	G,T
Risser	G
Rudolph	T
Sauer	G
Schrueder	E
Schmutz	D
Sims	G
Smith	D
Strain	E
Swank	E
Tieszen	T
Ting	D
Tisdale	D
Tomanek	G
Trlica	G
Tueller	D
Van Dyne	G
Wallace, A.	D
Ward	G
Waring	C
Weaver	G
Webb	C
Webber	T
West, N.	D
Whitman	G
Whitson	D
Wiebe	D
Williams	G
Wuenscher	E
Young	G
Zobel	C

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Terrestrial Animals

Anderson, R. D.	D	McBrayer	D,E
Andrews	G	McDaniel	G
Baldwin	G	McLean	T
Balph	D	MacMahon	D
Banks	T	Mamkau	D
Bell	G	Mitchell, J.	G
Bender	D	Nagy	D
Birney	G	Nutting	D
Bjornn	D	Paris	G
Blocker	G	Pitelka	T
Brown	T	Raitt	D,G
Brusven	D	Randolph	E
Burdick	G	Reichle	E
Cade	T	Rice	G
Chew	D	Richter	C
Cockrum	D	Russell	D
Coleman	G	Ryder	G
Crawford	G	Saul	D
Cringan	G	Schreiber	D
Crossley	E,G,T	Schwartz	G
Daterman	C	Scott	G
DeWolfe	T	Sher	D
Dingman	D	Shoemaker	D
Dixon	D	Sims	G
Dueser	E	Sleeper	D
Dyer	G	Smart	T
Edney	D	Smith	D
Edwards	T	Soholt	D
Ellis	G	Swift	G
Feist	T	Tevis	D
Ferris	E	Trost	D
French	G	Turner	D
Golley	G	Ueckert	G
Graul	G	Underwood	T
Hansen	G	Van Gundy	D
Hanson	D	Van Hook	E
Harris, L.	G	Vaugham	D
Haverty	D	Wagner	D
Hoffman	G	Wallace, J.	G
Hsiao	D	Werner	D
Johnson, D.	D	West, G	T
Johnston	G	White, C.	T
Jorgensen, C.	D	White, R.	T
Kadlec	G	Whitford	D
Knowton	D	Wiens	D,G
Lavigne	G	Williams	E
Lloyd	G	Wirtz	D
Lower	D	Wunder	G
Lowrie	D	Zimmerman	D
Luick	T		

Aquatic Plants

Adams	E	McCracken	E
Allen	E	McRoy	T
Boylen	E	Miller, M.	T
Deacon	D	Stanley	T
Herrmann	G	Taub	C
Howard	E	Titus	E
Koonce	E		

Aquatic Animals

Anderson, N.	C	LaRoe	E
Burgner	C	McNaught	E
Deacon	D	Magnuson	E
DeLacy	C	Miller	T
Dodson	T	Minshall	D
Eggers	C	Paulsen	C
Elwood	E	Perrotte	E
George	E	Stalnaker	D
Hall	C	Taub	C
Hasler	E	Thorne	C
Herrmann	G	Wallace, R.	D
Hilsenhoff	E	Whitney	C
Holman	D	Wissmar	C
Kitchell	E	Wydoski	C

Decomposers

Alexander	T	Garland	G
Angel	C	Gerdemann	G
Arkley	T	Gersper	T
Barsdate	T	Harris, J.	G
Baugh	G	Harris, L.	G
Benoit	T	Hobbie	T
Best, G.	E	Hunt	G
Boylen	E	Hunter	E
Cameron	D,T	Jorgensen, J.	E
Christensen	G	Kl	G
Clark	G	Ku ra	G
Clesceri, L.	E	McBrayer	D,E
Coleman	G	McClellan	G
Cornaby	E	Metz	E
Cromack	E, G	Pengra	G
Doxtader	G	Scarborough	T
Edmonds	C	Staffeldt	D,G
Edwards, N.	E	Stanton	G
Ensign	E	Thayer	G
Everett	T	Triska	C
Ferris, J.J.	E	Van Cleve	C,T
Ferris, J.M.	E	Wicklow	G
Flanagan	T		

Nutrients, Cycling and Soils

Alexander	T	Hart	C,D
Ashcroft	D	Johnson, D.	C
Aulenbach	E	Jorgensen, J.	E
Barsdate	T	Jurinak	D
Best, G.	E	Keeney	E
Best, S.	E	Kline	C
Bledsoe, L.	G	Kobayashi	E
Blincoe	D	Likens	G
Boyle	E	McKell	D
Cable	D	McRoy	T
Campbell	D	Norton	D
Carpelen	D	Pettit	G
Chapin	T	Post	D
Clark	G	Peuss	G
Clesceri, N.	E	Schreuder	E
Cole	C	Sims	G
Colwell	D	Skujns	D
Cornaby	E	Southard	D
Cromack	C	Staffeldt	D,G
Delwiche	G	Stark	D
Edmonds	C	Swindel	E
Edwards, N.	E	Thames	D
Everett	T	Trappe	C,G
Ferris, J. J.	E	Viereck	C
Franklin, W.	G	Wallace, A.	D
Gessel	C	Wells	E
Grier	C	West	D
Hanks	D	Whicker	G
Harris, G.	D	Woodmansee	G

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Biological Processes

Anderson, A. W.	C	Sedell	C
Behan	C	Strand	C
Bledsoe	C	Stross	E,T
Carroll	C	Taber	C
Detling	G	Trappe	C,G
Emmingham	C	Walker	C
Pike	C	Webb	C
Scott	C		

Modeling

Bledsoe, L.	G	Park	E
Bloomfield	E	Parton	G
Botkin	G	Patten, B.	G
Bridges	D,T	Prusso	D
Bunnele	T	Reed	C
Chapman	C	Reuss	G
Collier	T	Richey	C
Comanor	D	Rogers	C
Cooper	E	Romesburg	D
Davis	C	Sauer	G
Dean	T	Shugart	E
Detling	G	Smith, F.	G
Ek	E	Sollins	C
Goodall	D	Strand, M.	C
Green	T	Swartzman	C,G
Hatheway	C	Swift	G
Haug	G	Van Dyne	G
Hunt	G	Van Winkle	E
Innis	D,G	Waide	E
Kercher	E	Watt	G
Koonce	E	West	D
Loucks	E	Wiegert	G
McIntire	C	Wiens	G
Miller, D.	T	Wilkinson	E
Norton	D	Wlosinski	D
Olson	E	Woodmansee	G
O'Neill	E		

Site Administration

Adams	E	Monk	E
Cleseeri, N.	E	Morris	G
Collins, D.	G	O'Farrell	G
Grossley	E	Pieper	G
Dodd	G	Reichle	E
Duncan	G	Rickard	G,T
Harris	E	Risser	G
Huddleston	G	Shoop	G
Jameson	G	Strain	E
Knoerr	E	Tomanek	G
Lewis	G	Weaver	G
Loucks	E	Whitman	G

Physical Processes

Belt	C	Knoerr	E
Brown	T	LaVelle	G
Dirmhirm	C,D	Parton	G
Douglass	E	Price	G
Elwood	E	Singer	C
Franklin, W.	G	Smith, F.	G
Hanks	D	Thames	D
Hatheway	C	Trappe	C,G
Hein	G	Tsukada	C
Hutchinson	E	Warren	C
Ives	T	Whicker	G
Kanemasu	G		

Regional (Biomewide) Analysis

Anderson	E	Hett	E,C
Art	E	Johnson, F.	C
Burgess	E	Johnson, W.	E
Cole	C	Kurmes	C
Cottam	E	Mogren	C
Cromack	F,C	Reed	C
Crow	E	Reid	C
Deitschman	C	Stearns	E
Ek	E	Steinhoff	C
Emmingham	C	Swanston	C
Grier	C	Van Cleve	C,T
Hall	C	Wiereck	C
Hart	C,D	Wydoski	C

Information

Baker	G	Sterling	E
Brown	T	Stone	E
Johnson, M.	E	Strand	E
Carlson	G	Underwood	T
Ferguson	E,D	Watts	E
Johnson, D.	C	West	T
Marshall, K.	D		

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RESEARCH SITES

Average Annual Precipitation		Characteristic Vegetation
mm (in.)		
	1. Drainage Basin of Cedar River Cascade near Seattle, Washington (Principal Site)	Cedar, Hemlock, Douglas fir
2300(90)	2. H. J. Andrews Exp. Forest, Cascade Mts., Oregon (Principal Site)	450-year-old Douglas fir (*Pseudotsuga menziesii*) with a moderately well-developed under-story tree canopy of *Tsuga heterophylla* in the more mesic habitats and *Castanopsis chrysophylla* in the more xeric.
	3. Eagle Lake, California	
	4. Castle Lake, California	
	5. Flathead Lake, Montana	
	6. Little South Priest Lake, Idaho	
	7. Upper Logan Canyon, Utah	Douglas fir forest
	8. White Canyon-Cedar Mesa, Utah	Juniper pinyon woodland
	9. Cache la Poudre River, Colorado	
	10. Wood River Lakes, Alaska	
	11. Fairbanks Area, Alaska	Spruce birch forest
	DESERT BIOME	
	12. Deep Canyon, California	
	13. Saratoga Spring, California	
100(4)	14. Rock Valley, Nevada (PS)	Sparse cover of Mojave Desert shrubs including *Larrea tridentata, Ambrosia dumosa, Lycium* spp., *Ephedra nevadensis*, and *Krameria parvifolia*) with desert pavement in between shrub clumps and a vigorous growth of ephemerals in favorable years.
250(10)	15. Curlew Valley, Utah (PS)	Part of the site is a sagebrush community (*Artemisia tridentata*, with *Atriplex confertifolia* and the perennial grass *Sitanion hystrix*) with few annual species; the other part is a ploughed seeding of crested wheatgrass (*Agropyron desertorum*).
156(6)	16. Pine Valley, Utah (PS)	Low-growing shrubs, chiefly *Atriplex confertifolia and Ceratoides lanata*, with several perennial grasses (*Sporobolus cryptandrus, Orzopsis hymemoides and Hilaria jamesii*) and a variety of sparse annuals.
264(10)	17. Silverbell Bahada, Arizona (PS)	Sonoran desert vegetation with cactus (including saguaro) and the sub-trees *Olneya tesota, Circidium microphyllum* and *Acacia* spp., and the smaller shrubs *Larrea tridentata* and *Ambrosia deltoidea*; two ephemeral communities emerge with the bimodal rainfall pattern.

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	18. Sycamore Creek, Arizona	
223(9)	19. Jornada, New Mexico (PS) (also grassland site)	One site on a bajada dominated by cresotebush (*Larrea tridentata*) with other perennials mainly associated with arroyos, and a site on a nearby playa whose bottom is dominated by *Panicum obtusum* and *Xanthium strumarium* while shrubs such as mesquite, yucca, *Ephedra trifurca* and *Xanthecephalum sarothrae* are prominent on the playa fringe; a variety of annuals can occur at both sites.
	GRASSLAND BIOME	
223(9)	19. Jornada, New Mexico	(see above)
210(8.5)	20. Hanford, Washington (ALE)	*Bunchgrass Areas:* *Agropyron spicatum*, bluebunch wheatgrass; *Stipa comata*, needle and thread grass; *S. thruberiana*, Thurber's needle grass; *Poa secunda*, Sandberg bluegrass. *Old Field:* *Bromus tectorum*, cheatgrass: *Tragopogon dubius*, yellow salsify; *Microseris lanciniata*, cutleaf microseris; *Sisymbrium altissium*, tumble mustard.
482(19)	21. San Joaquin, California	*Abundant grasses:* *Bromus mollis*, soft chess; *Bromus diandrus*, ripgut brome; *Festuca megalura*, foxtail fescue. *Other grasses and grasslikes:* *Bromus arenarius*, Australian chess; *Bromus rubens*, red brome; *Avena barbata*, slender oat; *Juncus bufolis*, toad rush.
	22. Bison, Montana	North-facing slopes are dominated primarily by rough fescue and Idaho fescue. South-facing slopes are dominated by either a bluebunch wheatgrass, prairie junegrass, native bluegrass complex or , if the site is steep and rocky, a bluebunch wheatgrass—three awn association may be present. Flat ridges contain a mixture of Idaho fescu, bluebunch wheatgrass, and rough fescue. Benchlands consist largely of bluebunch wheatgrass and a variety of associated plants depending on soil texture and possibly soil structure.
	23. Bridger, Montana	Mountain bunchgrass forb.
317(12.5)	24. Pawnee, Colorado (PS)	The native shortgrass range vegetation is a basically blue grama and buffalo grass, supplemented in many areas by thread leaf and needle leaf sedges. Several mid-grasses, such as western wheatgrass needle-and-thread, green needle grass, little bluestem and side oats grama grow in association with the short-grasses.
406(16)	25. Cottonwood, South Dakota (Some 1970 observations were also made in mixed prairie sites at Dickinson, N. Dakota and Hays, Kansas.)	This site lies in the central portion of the mixed prairie. In high range condition the vegetation is dominated by midgrasses (especially *Agropyron smithii* and *Stipa virdula*) with an understory of shortgrasses (especially *Bouteloua gracilis* and *Buchloe dactyloides*). Several forbs are conspicuous during the early part of the year.

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U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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940(36)	26. Osage, Oklahoma	*Andropogon gerardi, A. scoparius, Panicum virgatum, P. scribnarianum, Boutelouo curtipendula, B. gracilis, Sorghastrum mutans, Sporobolus asper, Leptoloma cognatum, Aster ericoides, Baptisia leucophaea, Liatris punctata, Petalostemum candidum.*
533(21)	27. Pantex, Texas	The Pantex grassland sites are characterized as shortgrass prairie with blue grama predominating. Throughout the study areas plains prickly pear is very evident. Additionally small colonies of kochia are noticeable near rodent and ant disturbed areas.
EASTERN DECIDUOUS FOREST BIOME		
800(34)	28. Lake Wingra, Madison, Wisconsin (PS)	Lake Wingra, located within the city of Madison, Dane County, Wisconsin, 54°3′ N, 88°24′ W) is a small, shallow eutrophic lake with a surface area of approximately 1.35 km² and a mean depth of 2.5 m. The drainage basin includes about 75 percent urban area (residential housing, businesses, parks, schools, etc.) and about 25 percent University of Wisconsin Arboretum, an area of forest, prairie, and marsh. Approximately three-fourths of the shoreline is covered with trees and srubs. Commonly found species include cotton wood *Populus deotoides),* willow *(Salix nigra),* and box elder *(Acer negundo).* Less common species include the red oak *(Quercus rubra),* American elm *(Ulmus americana),* red dogwood *(Cornus stolonifera),* honeysuckle *(Lonicera bella),* and common buckthorn *(Rhamnus cathartica).* A dense macrophyte community, dominated by *Myriophyllum spicatum,* characterizes the littoral zone and the pelagic zone is characterized be relatively high rates of phytoplankton production of algae associations. Nannoplankton and ultraplankton dominate.
910(36)	29. Lake George, New York (PS)	The Lake George study site exemplifies the opposite end of the spectrum of aquatic system conditions from Lake Wingra. Modeling of the aquatic ecosystem has been the major emphasis of the Lake George research team. Lake George (45°33′ N, 73°24′ W) is a large, oligotrophic, stratified, soft water lake located in the rugged, densely wooded Adirondack Mountains of New York. The lake's drainage basin covers 606 km² with 114 km² (19%) occupied by the lake itself. The lake is 53 km long, has a maximum width of 4.8 km and a maximum depth of 57 m, and is at an elevation of 98 m. The lake is divided into two basins by the "narrows," a construction in the lake basin with numerous islands. The southern end can be characterized as mesotrophic and is greatly affected by the surrounding resorts. The village has a winter population of 4,000 which swells to 80,000 in the summer time. The northern basin is oligotrophic with most of the basin covered with forest characterized by mixed northern hardwoods, with spruce and fir in the upper elevations and red pine in the lowlands.

1370(54)	30. Oak Ridge National Laboratory Tennessee (PS)	The Oak Ridge site (35°58′ N, 84°17′ W) is in the U.S. Energy Research and Development reservation, which is comprised of 15,175 hectares of forest and former agricultural land. The topography consists of parallel ridges and valleys in a northeast direction. The Walker Branch Watershed study area was established in 1967 to investigate the drainage basin in a total ecosystem contect. This 97.5 hectare catchment is predominately forested with oaks-hickories, *(Quercus* spp., *Carya* spp.), *yellow* poplar *(Liriodendron tulipifera)*, and pine *(Pinus echinata)* defining over 75 percent of the 21 m^2/ ha basal area. Approximately 25 percent of the watershed was cleared for agriculture prior to 1942. Succession has restored this area to a well-stocked forest. Yellow poplar is especially abundant in secondary communities and the understory flora is reminiscent of more mesophytic communities. Since 1942, only two disturbances have taken place on the forest: (1) the establishment of a small (2.5 ha) loblolly pine *(Pinus taeda)* plantation in 1952, and (2) a forest fire in 1967 which burned over one-third of the area. A dense shrub layer has now developed under the heavy canopy on the burned area.
1880(74)	31. Coweeta, Franklin, North Carolina (PS)	Coweeta Hydrologic Laboratory is located 10 miles south of Franklin, North Carolina in the Nantahala Mountains of the Blue Ridge province in the Southern Appalachians. The research site is a 2185 hectare area containing a network of 31 gaged watersheds. It was established in 1933 by the USDA Forest Service with the objective of studying the effects of forest land usage upon quantity and quality of streamflow. Logging ceased in 1923 and a series of vegetation alteration treatments was initiated in 1939. The topography is rugged and steep with elevations ranging from 685 m at the main station to approximately 1592 m at the peak of Albert Mountain. Sharp-crested ridges form natural boundaries for over 40 small watersheds. Forests of American chestnut *(Castanea dentata)*, oaks *(Quercus* spp.), and hickories *(Carya* spp.) originally covered the area. Chestnut, which once made up nearly half the timber stand, has been virtually eliminated since 1930 as a consequence of the chestnut blight. Important understory species are mountain laurel, rhododendron, dogwood, and witch hazel. The herb layer is rather sparse, with ferns composing much of the ground vegetation. There are currently about 60 tree and shrub species found on the research area.

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1168(46)	32. Triangle, Durham, North Carolina (PS)	The research site is in east-central Alamance County near Saxapahaw, North Carolina. A managed loblolly pine *(Pinus taeda)* plantation on the Duke Forest was used for initial studies. The IBP research area was called the Saxapahaw Research area to distinguish it from the Blackwood Research site (35°58′ N, 76°06′ N) where other characteristics of this forest have been studies. A plot of about 3.5 hectares was chosen from aerial photographs for the study. The Blackwood Research site has a hardwood site classified as part of a mesic hardwood oak woods and a pine site representative of a successional stage of a similar climax forest type.
	TUNDRA BIOME	
124(5)	33. Barrow, Alaska (PS)	Vegetation is dominated by grasses and sedges. *Carex aquatilis, Dupontia fischeri,* and *Eriophorum augustifolium* collectively comprise, about 75% of the vegetation. Willows (*Salix* spp.) occur on the drier ridges, slopes, and polygon tops.
	34. Prudhoe Bay, Alaska	Vegetation is dominated by sedges and mosses. In upland tundra sites the main species are *Eriophorum triste, Carex aquatilis, C. bigelowii, Dryas integrifolia, Salix reticulata, Tomenthypnun nitens,* and *Thamnolia subliformis.* Exposed dry sites have *Dryas integrifolia, Carex rupestris, Oxytropis nigrescens, Saxifraga oppositifolia,* and *Lecanora epibryon* with other crust lichens. In the wet areas common species include *Carex aquatilis, C. saxatilis, Eriophorum aogustifolium, Pedicularis sudetica, Drepanocladus lycopodoides,* and *Scoridium scorpioides.* The base-rich soils support abundant calciphiles such as *Dryas integrifolia, Saxifraga oppositifolia,* and *Scorpidium scorpioides,* and lack acidiphiles such as *Sphagnum* and many members o fthe Ericaceae.
690(26)	35. Eagle Summit, Alaska	The most common genera include *Carex* and *Saxifraga* (12 species), *Cladonia* (excluding *Cladina*) and *Salix* (11 spp.), *Cetraria* (10 spp), *Lophozia, Luzula, Parmelia,* and *Pedicularis* (7 spp), *Hypnum, Minuartia, Senecio,* and *Stellaria* (6 spp), and *Alectoria, Dicranum, Poa,* and *Umbilicaria* (5 spp).
131(5)	36. Niwot Ridge, Colorado	The vegetation on the ridge is characterized by closed meadow on level ground with an abundance of herbs which gives way to disrupted mats where solifiuction is prevalent. Some 40% of the ridge is covered with fellfield communities characterized by *Trifolium dasyphyllum* and *Selaginella densa;* 20% is covered with meadows dominated by *Kobresia myosuroides.* Both fellfields and *Kobresia* meadows are dry and have little winter snow cover. The remainder of the vegetation consists of moist and wet meadows and snowbeds.

BIBLIOGRAPHIC SOURCES

Abstract Series

An abstracts series (ABSTRACTS—US International Biological Program Ecosystem Analysis Studies) describing the biome reports (journal articles and internal reports) and numeric data sets has been published by Colorado State University and Oak Ridge National Laboratory. This series is a cooperative effort to document results of the US/IBP biomes and to provide extensive distribution of research results. Each biome provides documentation of open literature, internal reports, and numeric data sets. Information contained in this documentation includes investigators, title, abstract, subject category, keywords, geographic description of research, duration of research, experimental methods and design, taxonomic names of species studied, availability of reports or numeric data sets, cross references to other data or reports, data set description (name, format, media, parameters measured, missing data, error bounds, data source, and comments pertinent to the description of the data), and supporting documents which are available (see example).

Selected fields for each abstract are included in the ABSTRACTS publication, as well as indexes for authors, keywords, subject category, and taxonomic names. This bibliographic file is also available on-line for computer searches at the Oak Ridge National Laboratory. Currently this file contains 2793 entries and can be searched on a wide number of field identifiers. Full text or selected fields can be printed.

For further information on the ABSTRACTS publication or the availability of computerized searches on the US/IBP bibliographic file, please contact:

Julie Watts, EDFB Information Center
Environmental Sciences Division
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FTS: 850-0396

Example of abstract

Hett, J. M.; Loucks, O. L.

Age structure models of balsam fire and eastern hemlock

J. Ecol. 64(3):1029-1044

O. L. Loucks, Dept. of Botany, University of Wisconsin, Madison, WI

Modeling: Terrestrial

Population Dynamics; Life Span; Age Structure; Balsam; Hemlocks; Mathematical Models; Mortality; Trees.

Abies Balcamea; Tsuga Canadensis.

Canada, Ontario; Port Arthur; Canada, Ontario, Little Dog Lake; Canada, Ontario, Sibley; Canada, Ontario, Pot Lake; Canada, Ontario, Northwest Lake; United States, Wisconsin, Gardner Dam; United States, Wisconsin, West Branch

Research on plant populations has most often emphasized life-history studies with little long-term data on the dynamics of the populations. This paper explores a quantitative approach to the dy-

namics of plant populations throughout a long lifespan, including estimation of vital population statistics and examination of these parameters through time. The objective has been to examine mathematical models describing population depletions in ABIES BALSAMEA and TSUGA CANADENSIS and to use the models to interpret mortality rates and other aspects of the biology of these tree species. The models investigated were the negative exponential, the power function, and a negative exponential sine wave. The negative exponential implies a constant mortality rate, and has been used in previous studies to describe age-structure of seedlings and herbs. The power function is one of a family of distributions that could be fitted to populations with a survival pattern following a positively skewed distribution, implying a changing mortality rate. The results show that the negative exponential model does not adequately describe age depletions in long-lived species, and that the power function is an adequate model if one overlooks wave-like departures from the straight-line fits. However, all of the balsam fir and hemlock populations showed an oscillation around the straight line form of the first two distributions. A sine wave model was developed to determine whether the population distributions could be described more adequately, and whether a characteristic wave length occurred for each species. The sine wave model appears to be the best, but much more data will be needed to provide for a complete analysis of the oscillations in age-structure of these two species. An explanation of the cycle in terms of gradual changes in survivorship due to changes in stand structure is suggested.

Contribution No. 267
EDFB/IBP
NSF/USIBP
Journal
1976
30:10

Bibliographies of Biome Publications

Lists of journal articles and other printed material have been prepared at each biome center. Some biomes have also listed theses and meeting presentations. There are also lists showing reports prepared primarily for use within the framework of IBP. These "internal reports," together with unpublished M.S. theses, Ph.D. dissertations and meeting presentations, form a large body of "grey" literature. Any access to these information materials should be through the author who can advise you if a revised, up-to-date version is available for use and citation. The open literature includes all papers appearing in scientific journals, symposium proceedings or other publications that have survived the rigors of peer review. Even here, the author remains the best source of interpretation, amplification, and reprints.

Table 1 provides a statistical summary of biome literature.

TABLE 1. Biome Literature

	Coniferous	Desert	Grassland	E. Deciduous	Tundra
Open Literature	(sequentially numbered) 210 contributions (incl. 8 biome bulletins)	(author alphabetic) 188 (+3 Tunisia publications)	(alphabetic) 276	(numbered) 272	(alphabetic) 218
Internal Reports	(numbered) 162 (at least 110 no longer available)	(numbered by year) 274 through 1975	(numbered) 316	(numbered by year) 404 memo reports 72 other reports	(numbered by year) 81 data reports 20 reports
Theses	(alphabetic) 30 terrestrial (11 PhD) 46 aquatic (8 PhD)	30 PhD	46 PhD 61 MS		22 PhD 33 MS
Presentations	5 listed with open literature	(alphabetic) 196	(alphabetic) 422		

Copies of publication lists can be obtained from the institutions that have served as biome centers:

Coniferous Forest

College of Forest Resources
University of Washington
Seattle, WA 98195

Desert

Ecology Center
Utah State University
Logan, UT 84322

Grassland

Natural Resource Ecology Lab.
Colorado State University
Ft. Collins, CO 80523

E. Deciduous Forest

EDFB Information Center
Env. Sci. Div.
Oak Ridge National Lab.
Oak Ridge, TN 37830

Tundra

C.R.R.E.L.
Atten: Dr. Jerry Brown
Box 282
Hanover, NH 03755

To defray costs (copying, mailing, etc.), charges may be necessary.

Journals with Biome Papers

Certain publications have served, and will continue to serve, as outlets for papers based on biome research. Table 2 was prepared using the open literature bibliographies and it lists, alphabetically, the journals in which two or more biome papers have appeared. It also serves as a publication profile for each biome, indicating, for example, that *Arctic and Alpine Research* is a good source of papers on tundra.

Additional information on the journals (publishing organization, subscription rates, etc.) can be obtained through the periodical section of a library. The most complete source of information on periodicals is Ulrich's International Periodicals Directory, 2289 pp. (16th edition 1975-76 R. R. Bowker Co., A Xerox Education Co., New York & London). Another good source is the Standard Periodical Directory, 1715 pp. (5th edition 1977, Oxbridge Communications, 1345 Avenue of the Americas, New York, NY 10019). One or both should be available in the reference section of a library.

TABLE 2

Biome Papers Published in Scientific Journals

	C	D	G	E	T
Acta Theriol.		2	1		
Ag. Meteorology				2	1
Alaska Arctic Tundra					3
Amer. Acad. Arts & Sciences		1		1	
Amer. Birds			4		
Amer. Journal of Bot.		3			1
Amer. Mid. Nat.	1	5	12	10	1
Amer. Nat.		1		3	
Amer. Soc. Agr. Eng. Trans.			2		
Ann. Bot.			2		1
Ann. Ent. Soc. Amer.	2	3	2	1	
Ann. Rev. Ecol. & Syst.	1	4	1	1	
Appl. Microbiology			2	2	
Appl. Optics			2		
Arctic					2
Arctic & Alpine Research					26
Arctic Bulletin					2
Auk			1		3
Biology - Bulletin				1	1
Biometrie - Praximetrie	2				
BioScience	1			2	1
Bot. Rev.		2			
Bryologist	1				
Bull. Ecol. Res. Comm.	1	1	1		2
Bull. Ecol. Soc. Amer.		2	1	1	
Bull. Geol. Soc. Amer.				2	
Can. Jr. Bot.	1	2	2	3	5
Can. J. For Res.	4			2	
Colorado Outdoors			3		
Comp. Biochem. Physiol.		5			
Condor		2	5		2
Crop. Sci.			2		
Ecology	2	3	9	13	6
Ecol. Monographs	1		4	2	
Env. Conserv.				1	1
Env. Entomol.		6	4	2	
Forest Sci.	5			6	
Freshwater Biology				2	
Herpetologica		4			
Hydrobiologia	3			1	1

	C	D	G	E	T
Insectes Sociaux		4			
J. Animal Sci.			4		
J. Applied Ecology	2		7	3	1
J. Ecology	1	1	1	5	
J. Env. Management		1	1		
J. Env. Quality			1	2	1
J. Hydro.		2			
J. Kansas Ent. Soc.			2		
J. Mammology		7	3		3
J. Math. Biosci.					2
J. Protozoology			1		1
J. Range Manag.		3	32		
J. Wildlife Manag.		2	5		2
Limn. & Ocean	2				5
Mycologia	2		1		
Nat. Res. (UNESCO)			2		
Nature		1		1	1
Northwest Sci.	6				1
Oecologia		5			2
Ohio J. of Sci.		2			1
Oikos	2		4	5	5
Pedobiologia				3	
Photogramm. Eng. & Remote Sensing			4		
Photosynthetico	1	2	3	4	1
Plant Phys.	1	3	1		
Plant & Soil	1		1	1	
Proc. Ent. Soc. Wash.		1			
P. Soil Sci. Soc. Amer.	1	10	2	2	
P. Utah Acad. Sci.		2			
Raptor Res.			2		
Science		1	1	4	3
Simulation			2	3	
Soil Biology & Biochemistry		2	2	3	
Soil. Sci.		3	1	2	
Southwestern Naturalist		3	6		
Trans. Am. Fish Soc.				2	
Utah Sci.		9			
Vegetatio		1		2	
Verh. Int. Verein. Limnol				4	3
Water Resources Research	2		1	3	1
Wilson Bull.			2		

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Biome Books (symposium proceedings, synthesis volumes, etc.)

Researchers from each biome have made important contributions to multiauthored volumes on ecosystem science. Although these are cited in biome bibliographies of open literature, it should be noted that most of these books are not officially sponsored by IBP.

Anderson, J. and A. MacFadyen (eds.) 1976
The Role of Aquatic & Terrestrial Organisms in Decomposition Processes
Blackwell Sci. Pub., London

Berrier, B. and C. H. Winget (eds.) 1975
Forest Soils and Forest Land Management, Proceedings of the Fourth N. Am. Forest Soils Conference held at Laval Univ., Quebec in August 1973

*Blair, W. F. (ed.) in press
Big Biology: The US/IBP
Dowden, Hutchinson and Ross, Stroudsburg, PA

Bliss, L. C. and F. E. Wielgolaski (eds.) 1973
Proceedings of the Conference on Primary Production and Production Processes, Tundra Biome, Dublin, Ireland, April 1973
(Available from Dr. L. C. Bliss, Dept. of Botany, Univ. of Alberta, Edmonton, Alberta, Canada, $4.00)

Brian, M. V. (ed.) in press
Production Ecology of Ants and Termites
Cambridge Univ. Press, London

Brown, J. (ed.) 1975
Ecological Investigations of the Tundra Biome in the Prudhoe Bay Region, Alaska
Bio. Papers of the U. of Alaska, Special Report No. 2, 215 pp.
(Available from Biological Papers, 202 Bunnell Bldg., Univ. of Alaska, Fairbanks, AK 99701, $10.00)

Cole, George W. (ed.) 1976
ELM: Version 2.0.
Rrange Sci. Dep., Sci. Ser. No. 20
Colorado State Univ., Ft. Collins, CO, 663 pp.

Conale, R. P. (ed.) 1976
Modeling Biochemical Process in Aquatic Ecosystems
Ann Arbor Sci. Pub., Ann Arbor, MI

Cody, M. L. and J. M. Diamond (eds.) 1975
Ecology and Evolution of Communities
Harvard Univ. Press, Cambridge

Congress of Ecology 1974
Proceedings of the First International Congress of Ecology
Centre for Agr. Publ. and Doc.,
Wageningen, The Netherlands

Cooper, J. P. (ed.) 1975
Photosynthesis and Productivity in Different Environments
IBP Vol. 3
Cambridge Univ. Press, London

Coupland, R. T. and G. M. Van Dyne (eds.) 1970
Grassland Ecosystems: Reviews of Research
Rrange Sci. Dep., Sci. Ser. No. 7
Colorado State Univ., Ft. Collins, CO, 208 pp.

Dent, J. B. and J. R. Anderson (eds.) 1971
Systems Analysis and Agricultural Management
John Wiley & Sons, Sydney

Dix, R. L. and R. G. Beidleman (eds.) 1969
The Grassland Ecosystems: A Preliminary Synthesis
Range Sci. Dep., Sci. Ser. No. 2
Colorado State Univ., Ft. Collins, CO, 437 pp.

Dix, R. L. and R. G. Beidleman (eds.) 1970
The Grassland Ecosystem: A Preliminary Synthesis. A Supplement
Range Sci. Dep., Sci. Ser. No. 2 Supplement 110 pp.
Colorado State Univ., Ft. Collins, CO, 110 pp.

Duvigneaud, P. (ed.) 1971
Productivity of Forest Ecosystems
UNESCO, Paris, 707 pp.

Franklin, J. F., L. J. Dempster and R. H. Waring (eds.) 1972
Proceedings—Research on Coniferous Forest Ecosystems—A Symposium
USDA Forest Service, Portland, OR, 322 pp.

Franklin, J. F. and C. T. Dyrness 1973
Natural Vegetation of Oregon and Washington
Gen. Tech. Rep. PNW-8
USDA Forest Service, 417 pp.

French, N. R. (ed.) 1971
Preliminary Analysis of Structure and Function in grasslands
Range Sci. Dep., Sci. Ser. No. 10
Colorado State Univ., Ft. Collins, CO, 382 pp.

Gates, D. M. and R. B. Schmerl (eds.) 1975
Perspectives of Biophysical Ecology
Springer-Verlag, Berlin, Heidelberg, NY, 609 pp.

Glantz, M. 1975
The Politics of Natural Disaster
Praeger Pub., NY

33

Golley, F. B. and H. K. Buechner (eds.) 1969
A Practical Guide to the Study of the Productivity of Large Herbivores
Blackwell Sci. Pub., Oxford

Golley, F. B., K. Petrusewicz and L. Ryszkowski 1975
Small Mammals: Their Productivity and Dynamics Vol. 5
Population
Cambridge Univ. Press, London

Hadley, N. (ed.) 1975
Environmental Physiology of Desert Organisms
Dowden, Hutchinson & Ross, Stroudsburg, PA

Hall, C. A. S. and J. W. Day, Jr. (eds) in press
Ecological Models as Tools: Theory and Case Histories
John Wiley & Sons, NY

Hamerstrom, F. N., Jr., B. E. Harrell and R. R. Olendorff (eds.) 1974
Management of Raptors
Raptor Res. Rep. No. 2
Vermillion, SD

Hasler, A. D. (ed.) 1973
Coupling of Land and Ecological Studies to Water Systems
Springer-Verlag, Berlin, Heidelberg, 309 pp.

Holding, A. J., O. W. Heal, S. F. MacLean, Jr. and P. W. Flanagan (eds.) 1974
Soil Organisms and Decomposition in Tundra.
(Available from Swedish IBP Committee, Wenner-Gren Center, Sveavagan 166, 1str, S-11346, Stockholm, Sweden, sw. cr. 25 = approx. U.S. $6.00)

Hulberg, L. C. (ed.) 1973
Proceedings of the Third Midwest Prairie Conference
Div. Biology, Kansas State Univ., Manhattan, KS

Iglovikov, V. G., A. P. Movsissyants, F. F. Sarganov, and A. A. Stepanenko (compilers) 1974
Biological and Physiological Aspects of the Intensification of grassland utilization
XII Int. Grassland Congr., Moscow, USSR

Iglovikov, V. G., A. P. Movsissyants, F. F. Sarganov, and A. A. Stepanenko (compilers) 1974
Improvement of Natural and Production of Seeded Meadows and Pastures
XII Int. Grassland Congr., Moscow, USSR

Innis, G. S. (ed.) in press
Grassland Simulation Model—US/IBP Grassland Biome Study
Springer-Verlag, New York, NY

Ives, J. D. and R. G. Barry (eds.) 1974
Arctic and Alpine Environments
Methuen & Co., London

Jeffers, J. N. R. (ed.) 1972
Mathematical Models in Ecology
Blackwell Sci. Pub., Oxford

Klein, W. M., J. G. Severson, Jr. and H. S. Parker (ed.) in press
Sulfur in the Environment
Missouri Bot. Gardens, St. Louis, MO

Large, O. L., E. O. Schulze and L. Kappen (eds.) in press
Water and Plant Life Problems and Modern Approaches
Springer-Verlag, Berlin, Heidelberg, NY

Lieth, H. (ed.) 1974
Phenology and Seasonality Modeling
Ecological Studies 8
Springer-Verlag, Berlin, Heidelberg, NY, 444 pp.

Lieth, H. and R. H. Whittaker (eds.) 1975
Primary Productivity of the Biosphere
Springer-Verlag, Berlin, Heidelberg, NY

Lillywhite, M. and C. Martin (eds.) 1971
Environmental Awareness
2nd Annu. Session Int. Environmental Sci., Proc., Colorado Chapter
Inst. Environ. Sci., Mt. Prospect, IL

Lundstrom, S. (ed.) 1974
Proceedings of the XIth International Congress for Game Biologists
LiberForlag, Stockholm, Sweden

*Mabry, T. J., J. Hunziker and D. R. DiFeo (eds.) in press
Creosote Bush: Biology and Chemistry of *Larrea* in New World Desert
Dowden, Hutchinson & Ross, Stroudsburg, PA

Marcelle, R. (ed.) 1975
Environmental and Biological Control of Photosynthesis
W. Junk, The Hague, Netherlands

Marshall, J. (ed.) in press
The Belowground Ecosystem: A Synthesis of Plant-Associated Processes
Rrange Sci. Dep., Sci. Series 26
Colorado State Univ., Ft. Collins, CO

McLaren, A. D. and J. Skujins (eds.) 1971
Soil Biochemistry, Vol. 2
Marcel Dekker, NY

McKell, C. M., J. P. Blaisdell and J. R. Goodin (eds.) 1972
Wildland Shrubs—Their Biology and Utilization
Gen. Tech. Rep. INT-1
USDA Forest Service, 500 pp.

Noy-Meir, I. (ed.) in press
Short-Term Dynamics of Ecosystems
Cambridge Univ. Press, London

34

Patil, G. P., E. C. Pielou and W. E. Waters (eds.) 1971
Statistical Ecology Vol. III
Many Species Populations, Ecosystems and Systems Analysis
Penn. State Univ. Press, Univ. Park, PA, 462 pp.

Patten, B. C. (ed.) 1971
Systems Analysis and Simulation in Ecology
Vol. 1 (see also Subsequent Volumes)
Academic Press, NY, 607 pp.

Prakash, I. and P. K. Ghosh (eds.) 1975
Rodents in Desert Environments
W. Junk, The Hague, Netherlands

Reichle, D. E. (ed.) 1970
Analysis of Temperate Forest Ecosystems
Ecological Studies 1
Springer-Verlag, Berlin, Heidelberg, NY, 304 pp.

Reichle, D. E., J. F. Franklin and D. W. Goodall (eds.) 1975
Productivity of World Ecosystems
NAS, Washington, DC, 166 pp.

Reichle, D. E. (ed.) in press
Woodland Synthesis Volume
Cambridge Univ. Press, London

Rosswall, Th. and O. W. Heal (eds.) 1975
Structure and Function of Tundra Ecosystems
Ecological Bulletins, NFR 20, Stockholm, August 1975
(Available from Swedish Natural Science Research Council, Wenner-Gren Center, Box 23136, S-105 35, Stockholm, Sweden Sw. Cr. 50 = approx. U.S. $11.90)

Reimold, R. J. and W. H. Queen (eds.) 1974
Ecology of Halophytes
Academic Press, NY

Rodin, L. E. (ed.) 1972
Ecophysiological Foundation of Ecosystems Productivity in Arid Zones
Publ. House Nauka, Leningrad, USSR

Russell, C. S. (ed.) 1975
Ecology Modeling in a Research Management Framework
Resources for the Future, Washington, DC, 394 pp.

*Simpson, B. B. (ed.) in press
Mesquite: Its Biology in Two Desert Scrub Ecosystems
Dowden, Hutchinson & Ross, Stroudsburg, PA

Simulation Councils, Inc. 1972
Proceedings of the 1972 Summer Computer Simulation Conference
La Jolla, CA

Simulation Councils, Inc. 1973
Proceedings of the 1973 Summer Computer Simulation Conference
La Jolla, CA

Simulation Councils, Inc. 1974
Proceedings of the 1974 Summer Computer Simulation Conference
La Jolla, CA

Simulation Councils, Inc. 1976
Proceedings of the 1976 Summer Computer Simulation Conference
La Jolla, CA

Smiley, T. L. and J. H. Zumberge (eds.) 1974
Polar Deserts and Modern Man
Univ. Arizona Press, Tucson, AZ

Stewart, W. D. P. (ed.) 1975
Nitrogen Fixation by Free-Living Micro-Organisms
Cambridge Univ. Press, London

Van Dobben, R. H. Lowe and McConnell (eds.) 1975
Unifying Concepts in Ecology
W. Junk, The Hague, Netherlands, 302 pp.

Van Dyne, G. M. (ed.) 1969
The Ecosystem Concept in Natural Resource Management
Academic Press, NY

Vernberg, F. J. (ed.) 1975
Physiological Adaptation
Intext Educ. Publ., NY

West, N. E. and J. Skujins (eds.) in press
Nitrogen Processes in Desert Ecosystems
Dowden, Hutchinson & Ross, Stroudsburg, PA

Whittaker, R. I. (ed.) 1973
Handbook of Vegetation Science
Part V. Ordination and Classification of Vegetation
W. Junk, The Hague, Netherlands

Whitton, B. A. (ed.) 1975
River Ecology, Studies in Ecology, Vol. 11
Blackwell Sci. Pub., London

Wielgolaski, F. E. and Th. Rosswall (eds.) 1971
Proceeding, IV International on the Biological Productivity of Tundra, Leningrad, USSR, October 1971
(Available from Swedish IBP Committee, Wenner-Gren Center, Sveavagen 166, 1str, S-113 46, Stockholm, Sweden, Sw. Cr. 20 = approx. U.S. $4.75)

Wright, R. G. and G. M. Van Dyne (eds.) 1970
Simulation and Analysis of Dynamics of a Semi-Desert Grassland
Range Sci. Rep., Sci. Series 6
Colorado State Univ., Fort Collins, CO

Zimmerman, J. H. (ed.) 1972
Second Midwest Prairie Conference
Univ. Wisconsin, Madison, WI

The synthesis volumes (marked with *) will be especially useful in interbiome comparisons and other basic analyses. Two volumes have been published, (neither under the analysis of ecosystems program); five are in various stages of production; outlines and editors for twelve additional volumes have been approved; and three additional outlines are under review, bringing the anticipated number of volumes in the U.S. Series to 22. For further information contact:

Dr. W. Frank Blair
P.O. Box 7366
University of Texas
Austin, TX 78712
512/471-3163

Synthesis volumes may be ordered from:

Dept. IBP, Halstead Press
A Division of John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10016

There is the possibility that a handbook on North American Ecosystems will someday bring together much of the data gathered by biome researchers. A study on the potential use and content of such a handbook has been conducted by The Institute of Ecology under the sponsorship of the National Science Foundation. The results of this study, together with other information, will be used in planning any future compilations of ecosystem data. The responsible program at NSF is:

Ecosystem Studies Program
National Science Foundation
Washington, DC 20550
202/632-5854

Evaluations of IBP

Another important, but controversial, source of information on the biome studies are four evaluation documents:

Battelle Columbus Laboratories. 1975. Final report for evaluation of three of the biome studies programs funded under the foundation's International Biological Program (IBP) to the National Science Foundation. Battelle Columbus Laboratories, Columbus, Ohio. 216 pp. and appendices.

Loucks, O. L. and Nancy McElreath. 1975. A position paper on national ecological data resources for The Institute of Ecology Committee on Ecosystem Studies—Advisory Committee on Data Exchange. The Institute of Ecology, Washington, D.C. 22 pp.

National Research Council (NRC). 1974. U.S. Participation in the International Biological Program—Report No. 6 of the U.S. National Committee for the International Biological Program. National Academy of Sciences, Washington, D.C. 166 pp.

National Research Council Committee to Evaluate the IBP. 1975. An evaluation of the International Biological Program. National Academy of Sciences, Washington, D.C. 81 pp.

The Battelle report authors also published an abridged version of their evaluation (Mitchell, R., J. Downhower and R. Mayer. 28 May 1976.) An Evaluation of Three Biome Programs. **Science** 192 (4242) 859-865. Letters stimulated by this article appeared in 4 March 1977 **Science** 195 (4281) 822-823, as did a rebuttal by Auerbach, S. I., R. L. Burgess, and R. V. O'Neill. The Biome Programs: Evaluating an Experiment, pp. 902-904.

Much of the controversy centers on the utility of data banks created as part of the biome programs. During the survey phase of the project that produced this guide, Peter Haug obtained additional information on the *data banks*, their problems, and their potential utility. This information made it possible for him to review the evaluation reports with special emphasis on data banking:

National Research Council

Chronologically, the first report (NRC 1974) appears to base its evaluations of the data banks partly on early IBP proposals rather than what was actually done; it bears little relationship to the existing situation. Statements appearing on page 21, for example, such as "data sets in similar depth were obtained at 25 locations," are simply untrue. Other statements mislead the reader into thinking that one of the primary objectives of the AOE program was accomplished, when it was not:

"The biome programs have similar procedures for compiling numerical material and storing it in data banks. Use of a common pattern ensures that data stored by one program can be read and used by another. Each data bank system provides for a written description of the data. Common elements in the descriptions include the investigator's name, location of research, parameters measured, key words, restrictions on dissemination of the data, and a brief description of the data set and experimental method" (NRC 1974, pp. 21-23).

The objective of maintaining uniform data banks that could easily transfer data between biomes was, in fact, a failure. Even when the NRC report was written in 1974, the following statement from page 2 was untrue: "The collected data from 25 primary sites cover a wide range of plant, animal, and environmental characteristics and are now available nationally through six data banks." In 1974, the tundra biome data bank had been closed for two years and the coniferous forest biome bank at the University of Washington was on the verge of closing. Unfortunately, statements such as those debunked above have given false hope to many who view IBP data as a source of environmental assessment information. Similar inaccuracies about the modeling efforts, which were supposed to be intimately connected with the data repositories, are also found in the report.

TIE Committee on Ecosystem Studies

In January, 1975, A Position Paper on National Ecological Data Resources (Loucks and McElreath) reviewed and analyzed much more realistically the problems facing the IBP data banks. This paper summarizes the findings of an Advisory Committee on Data Exchange comprising representatives familiar with data processing methods in each biome. In evaluating the national need, the report states that "certain types of data on ecological systems should be viewed as a national public resource, available for use in dealing with a variety of national, regional and scientific problems" (Loucks and McElreath, 1975, p. 2). The report continues (p. 5), "criteria will have to be established for selecting from among the available data those which will most closely meet national needs . . . data with the greatest variety of potential uses may be the most valuable and should receive the highest priority."

Large data banks are presently being developed by the Environmental Protection Agency, Battelle Memorial Institute in Ohio, Oak Ridge National Laboratory, and the National Oceanographic and Atmospheric Administration, to name a few sources already extant. IBP data are available from individual investigators and sometimes from data banks, but no program is designed to respond to any significant number of outside requests for data. This assessment corresponds to my findings.

Loucks and McElreath list the following elements as essential for making the available data resources meet national needs (p. 9):

1. A means of communicating nationally what is available, where it is, and how to inquire.
2. The means for effectively responding to requests forwarded to centers where data are available.

Battelle Report

The Battelle report (Battelle 1975) concluded (p. I-3), "The data banks, designed as a communication device to make biome research results available to biome program participants as well as the scientific community in general, were largely unsuccessful. The Grassland Biome program data bank did have fewer problems than the others and was used for communication by at least some of its scientists." That study found p. I-13), "The data bank organized and funded by the Grassland Biome management was useful to a limited extent to biome researchers for data exchange even though it was incomplete and plagued with access problems." In the Tundra Biome program (p. I-14), "Management did not specify standard data format or sampling procedures. Neither did management establish a data bank for the exchange of information. While a bank was planned, it was never implemented and communication among biome workers was achieved by other means, e.g., internal reports and personal communication."

I found that the tundra program did, in fact, begin a data bank which currently houses about a third of the biome data, data collected during the 1970 and 1971 summer field seasons. It is true that the bank never functioned very effectively and was abandoned in 1972. Most data that are in this bank are also available in the internal data reports.

Of the Eastern Deciduous Forest Biome, Battelle wrote (p. I-14): "The data bank, which could have been useful in the integration of output from the research sites into a coordinated biome level output, was initiated. However, it never became fully operational and was little used by biome researchers." I don't know how accurate this appraisal is; currently, the data bank receives about ten requests a month from biome researchers. In general, however, I concur with the Battelle statement (p. I-18) that "Problems with incomplete data sets, a lack of uniform data format, and a poor central catalog of the available data all acted to reduce accessibility and utility."

One major misconception of the Battelle report that leads to an extremely erroneous conclusion should be addressed. The report states (p. II-44): "The data sets collected during the Grassland Biome program were obviously the result of a coordinated effort but an examination of the list makes it quite clear that the data bank is not a comprehen-

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sive base of information. Only a fraction of the initial collection of data for modeling and synthesis can be done from the data sets. Therefore, the largest portion of the data must still be in personal, rather than central, files and personal exchange between investigators is required to accomplish the tasks of integration, modeling and synthesis."

The fact is that the vast majority of modeling and synthesis efforts in the grasslands were based on *prior* literature, field studies being used to *validate* the model, not for modeling *per se*. This can be easily seen from a perusal of the Ecosystem Level Model (ELM) documentation which states the source of each parameter and coefficient. From my conversion with the Grassland Biome personnel, I concluded that that data bank probably has the most complete array of field data of any of the biomes; it probably contains more than 99% of the data collected during the program.

Concluding the Battelle review, I would like to respond to four summary statements from the report (p. II-58). "The data banks are not operational and contain a very small fraction of the data collected under the biome program and it can be concluded that data banks were unnecessary for the biome programs." The Grassland and Desert data banks are very operational in that they are currently supplying data to IBP synthesizers. The Eastern Deciduous Forest data bank is extremely thorough in its input documentation, and it responds to about ten requests a month. Although the banks are not well equipped to respond to requests from outsiders unfamiliar with the IBP program, most requests come through a principal investigator who is familiar with the program as well as his own data. Most requests are processed in this way, and the principal investigator often uses the data bank as a source from which he can draw his data to pass on to a colleague.

Battelle, in fact, touched on this avenue in its statement (p. II-58) that "Most of the exchange of data was through personal contact, conferences, and internal reports," but what it failed to recognize was that the personal contact provides access to the data bank. I submit, therefore, that the data banks, while perhaps "unnecessary" in the absolute sense, served a very important purpose in assisting investigators to store, manipulate, and retrieve their data for themselves or for colleagues.

Perhaps the most valuable observation about the data banks to appear in the Battelle report is the following: "It appears that technical problems of handling ecological data have to be addressed and solved before data banks can serve a useful function." The banks already have served useful functions, but the potential for being more user-oriented, i.e., providing useful information to a user from outside the system, has been hampered by many technical problems that were not recognized until attempts were made to handle large quantities of ecological data.

Second National Research Council Report

Close on the heels of the Battelle report, but independent of it, was another evaluation prepared for NSF (NRC 1975). Although this concentrates on management and administration, it contains some comments relevant here. Apparently, attempts to store data on an international scale were largely unsuccessful, although the information resources at Oak Ridge National Laboratory include the International Woodlands Data Base with data from 126 sites in approximately 30 countries. The report quotes British scientist Roger Lewin as saying: "We underestimated our ability to collect data and overestimated our ability to make use of it." This certainly applies to the US/IBP as well, for there really is "no central place where all the IBP information will be readily available" (p. 38). The report concludes (pp. 61-62):

"One of the troublesome aspects of the Program was how to handle and store effectively the immense amount of data collected so that it would be available to future users. The need for intercommunication was particularly acute in the biomes, where progress reports and newsletters played an important role. Efforts to establish data banks were only partially successful and there was no adequately organized effort to preserve the progress reports and newsletters. It is hoped that the more important results will be preserved in the synthesis volumes and that papers based on IBP-sponsored research will continue to appear for some years in scientific periodicals. However, on the whole, storage and dissemination of data seem to have been among the less successful aspects of the IBP, both nationally and internationally." However, an earlier comment (p. 40) suggests that although "the extent to which data, reports, and publications have been preserved in an accessible manner leaves much to be desired, it is still not too late for remedial action."

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GLOSSARY

Data—any numbers generated by a research project without any accompanying interpretation

Raw Data—unedited basic numerical observations generated by experiment or observation

Transformed or converted data—raw data, such as records of electrical measurements from a recording instrument, that have been converted into biologically meaningful raw data, often in a format consistent with similar measurements from other studies (in a standardized format)

Edited data—raw or transformed data that have undergone careful scrutiny by a researcher and have been "cleaned up" by inserting missing data points or by eliminating or correcting obviously erroneous points

Summarized or reduced data—any combining edited data, including statistical analyses and reduction, or combining two or more parameters

Data abstract—brief documentation of relevant information about a data set stored in a data bank. It may have been written by an ecological researcher, by a statistician/analyst/programmer, or by some sort of joint effort among them

Literature abstract—an abstract of either an internal report, an article in a scientific periodical, or a thesis or dissertation

Information—any literature, abstracts, or data generated by a research project

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TABULAR SUMMARY OF SURVEY

		Coniferous Forest			Des
		UW, Terrestrial	UW, Aquatic	OSU	
I.	**What Kinds of Information Does Your Biome Have?**				
1.	What kinds of data and information exist at your center?				
1.1	Edited data sets?	Yes	Yes	Yes	Yes
1.2	Statistically summarized data sets?	Yes	Yes	No	No
1.3	Abstracts of data sets?	No	No	Yes	Yes
1.4	Internal reports?	Yes	*	*	Yes
1.5	Theses, dissertations?	No	*	*	No
1.6	Published articles in open scientific journals and books?	No	*	From authors	Fro
1.7	Synthesis volumes?	Not yet	*	*	Not
1.8	Abstracts of documents?	No	*	*	No
1.9	Current lists or bibliographies of documents?	Yes	*	*	Yes
1.10	Current abstract bibliographies of data sets?	No	*	*	ORN
1.11	Current abstract bibliographies?	Yes	No	No	No
2.	How are the data stored?				
2.1	Handwritten records?	No	No	No	No
2.2	Cards?	No	Yes	Yes	Yes
2.3	Tapes?	No	Yes	Yes	Yes
2.4	Discs?	Yes	Yes	No	Yes
3.	Is there a comprehensive scheme for standardizing all stored data to a uniform format?	No	Yes	No	No
4.	How flexible are your input documentation requirements?	No requirements	Formal & inflexible	Very flexible	Very
5.	What is your review procedure for internal reports?	Editorial only	*	*	Edit

IARY OF SURVEY RESULTS

OSU	Desert	Eastern Deciduous Forest	Grassland	Tundra
Yes	Yes	Yes	Yes	Partia ly
No	No	Yes	Yes	No
Yes	Yes	Yes	Yes	At ORNL
*	Yes	Biome & Memo Reports	Technical Reports, Range Science series	Data reports, modeling reports
*	No	In Biome Reports	Some in Technical Reports	Yes
From authors	From authors	From authors	From authors	From authors or CRREL
*	Not yet	Not yet	Not yet	Not yet
*	No	Yes, in NUTIS & ORLOOK	In Technical Reports & at ORNL	At ORNL
*	Yes	Same	Newsletters & ORNL	Yes
*	ORNL	Same	ORNL	At ORNL
No	No	Same	ORNL	At ORNL
No	No	No	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Some
No	Yes	Yes	No	Yes
No	No	Yes	No, but standardized by data type	No
Very flexible	Very flexible	Highly formalized & inflexible	Very flexible	Very flexible
*	Editorial only	4 or 5 reviewers within biome for Biome Reports	3 to 4 senior staff within biome	Colleagues within the biome

6.	Are you including any non-IBP data in your data bank?	Yes	Yes	Yes	Some	Not yet	Yes	No, bank is defunct
6.1	Is there any difference in accessibility between IBP data and non-IBP data?	No	No	No	No	No	Yes	N/A
7.	Is there any way of judging the reliability of data in your bank without referring to its use in the open literature?	No	No	No	No	No	No	No
8.	Are your data applicable to sites other than those at which they were collecting or to other uses?	Unknown	Unknown	Unknown	Some potential	Some potential	Some potential	Mostly
9.	Have your data any applicability for national environmental problems?	Unknown	Unknown	Some	None demonstrated	Potentially extensive see pp. 96-89 NRC Report #6 For examples	Possible; could be used as short-term baseline data	Probably
II.	**Who Are Potential Users?**							
1.	What are the current demands for data and other information from your center/from outside biome?	None; only by researchers using system	None; only researchers using system	Unknown; they come through biome researchers	About one year from outside biome	Variable; about 10 requests per month	Unknown; many requests are informal	Univ. of Alaska, none CRREL, varied requests
2.	Who has requested information from the center?	No outsiders	No outsiders	Mostly workers within biome	Modelers & synthesizers from within biome	Mostly researchers from within biome	99% from within biome	Biome researchers, synthesizers, EIS writers, students, & scientists from other countries
3.	What form or type of information have they requested?	N/A	N/A	Some	Mostly interpreted data in the form of report	Mostly internal reports, not data	Data manipulation & analysis	Data reports & other internal reports
4.	How have requests come into the center?	To researchers	N/A	Through principal investigaors	Mostly through biome	Mostly through biome researchers	Through biome researchers	Directly to researchers or to CRREL
5.	How do you expect these demands to change?	N/A	N/A	Seem to be increasing	No change	Slightly increasing trend	Slight decrease immediately followed by increase	No change
6.	Are ERDA's national laboratories aware of the biome information?	No	No	No	Somewhat	Yes	No	Only of researchers & literature, not data bank
7.	Who might other potential users be?	Lab technicians through principal investigators	Aquatic researchers	Researchers	Researchers	Mostly researchers	Modelers	Same the #2

* Uniform throughout biome; same as UW, Terrestrial.

		Coniferous Forest			Desert
		UW, Terrestrial	UW, Aquatic	OSU	
III.	**How Accessible Are Data Sets and Summaries from the Bank?**				
1.	Where can one obtain:				
1.1	Open literature reprints?	Authors	*	*	Authors
1.2	Internal reports?	If in print, Univ of Wash. Biome Bulletin	*	*	Utah St
1.3	Theses and dissertations?	UW Library, University Microfilms	*	OSU Library	USU, U Microfil
1.4	Bibliographies?	UW	*	*	USU
1.5	Data abstracts?	N/A	N/A	OSU Forest Research Lab.	ORNL
1.6	Edited & summarized data?	N/A	UW Fisheries Research Inst.	OSU Forest Research Lab.	USU
2.	Is your computer-based data bank system:				
2.1	Fully operational?	Yes	Yes	Yes	Yes
2.2	Accessible via telephone terminals?	Yes	No	No	No
2.3	Accessible only through an intermediary information specialist?	No	Yes	Yes	Yes
3.	Will your system:				
3.1	Produce tapes and/or cards containing edited data?	Yes	Yes	Yes	Yes
3.2	Produce tapes and/or cards statistically reduced data?	Yes	Yes	Some	Yes
3.3	Retrieve data differentially from within data sets?	Yes	Yes	No	No
4.	Do you have any standard procedures and/or forms a user must use to request data from your system?	No	No	No	No
5.	Is any documentation available from your system that would enable a user to get data from it easily on his own?	No	No	No	No

Ū	Desert	Eastern Deciduous Forest	Grassland	Tundra
	Authors	Authors	Authors	Authors; CRREL
	Utah State Univ.	ORNL: Nat'l Tech. Info. Svc.	NREL	Author; Univ. of AK Data reports; CRREL
U Library	USU, University Microfilms	Universities Biome Reports	Universities NREL— Tech. Rep.	Univ. of Alaska Lib. CRREL
	USU	ORNL	NREL; ORNL	ORNL; CRREL
U Forest search Lab.	ORNL	ORNL	ORNL	ORNL; CRREL
U Forest search Lab.	USU	ORNL	NREL	Data reports CRREL
s	Yes	Yes	Yes	No
	No	Abstracts only (ORLOOK)	No	N/A
s	Yes	Data & Abstracts	Yes	N/A
s	Yes	Yes	Yes	No
me	Yes	Yes	Yes	No
	No	Yes	Yes	No
	No	No	Only if request is large	No
	No	For ORLOOK only	No	No

5.1	How widely available is it?	N/A	N/A	N/A	N/A	Biome Reports	N/A	N/A
6.	How long would a newcomer who knows FORTRAN take to learn to use your system?	30 minutes	N/A	N/A	N/A	2 hrs. (ORLOOK)	N/A	N/A
7.	What interpretative services do you offer a user who wants data from your bank?	None	N/A	Data Abstract & Referral to Investigator	Printed materials, referral to p.i.'s & services	Printed materials, statistical analyses, & referral to p.i.'s	Printed materials, referrals & svc from raw data proc. thru biol. interp.	N/A
8.	What is the average turnaround time to process a user request?	N/A	N/A	Depends; 24 hrs. to 1 week	Depends; 24 hrs. to 2 weeks	24 hours	Depends; 24 hrs. to 2 wks.	N/A
9.	Do you have any formal priority system of processing requests?	N/A	N/A	No	No	No	Synthesis first	N/A
10.	How is your output documented when retrieving data?	N/A	N/A	See #7	Data abstract, pub; & format documentation	Data abstract, pubs; & labeled data set w/stat. summaries	According to user needs	N/A
11.	Is the output format standardized, uniform, and easily understood?	N/A	N/A	Not standardized	Not standardized	Yes	Tailored to user	N/A
12.	What is your system for screening requests for data?	None	None	Director or investigator	Director or investigator	Through investigators or director	Through investigators or director	Through investigators or director
13.	What restrictions have you on the use of the data?	None	Depends on request	None	Permission of investigators & directors	Abstract specifics	Permission of investigator w/in 2 years; none after that	Abstract specifics
14.	Is there any way you can guard against misuse or misinterpretation of the data?	No	No	No	No	No	No	No
15.	About how many edited data sets in your computer system by mid-1977?	50	30	210-250	700	225-275	1100	150
15.1	Is this the vast majority of the IBP data?	No	No	Yes	Yes	Yes	Yes	No, about ⅓ only
16.	When will your data bank be complete?	Never, it's growing	It's evolving	Indefinite because of new projects	1977	August 1977	Never, because of constant changes	N/A

* Uniform throughout biome; same as UW, Terrestrial.

DOCUMENTATION FORMS

These abbreviated examples are useful in showing how biome information has been processed in two biomes. Figure 1 is the form used by the Coniferous Forest Biome and Fgure 2 is the form used by the Eastern Deciduous Forest Biome. NUTIS is the system used in the Eastern Deciduous Forest Biome. See Strand, R. H. and D. G. Taylor (1974).

For examples of the documentation forms used in the Grassland Biome, contact the Natural Resource Ecology Lab, Colorado State University, Ft. Collins, CO 80523.

FIGURE 1

FILE_____
DATE_____
CONTINUATION
NO_____ YES_____

IBP CONIFEROUS FOREST BIOME
DATA SET DOCUMENTATION FORM

1. DATA TITLE:_____

_____

2. INVESTIGATORS:_____

_____

3. MAJOR PROFESSOR OR PRINCIPAL INVESTIGATOR:_____
4. RESEARCH SITE: H.J. Andrews and_____
5. LOCATION:_____
6. LEVEL:

|_| Ecosystem |_| Drainage |_| Regional |_| Interaction |_| Perturbation

7. PROCESS:

|_| Terrestrial Primary Production |_| Terrestrial Secondary Production
|_| Terrestrial Decomposition |_| Terrestrial Nutrient Cycling
|_| Land-Water Interaction |_| Aquatic Primary Production |_| Aquatic Secondary Production |_| Aquatic Decomposition |_| Aquatic Nutrient Cycling
|_| Meteorology |_| Hydrology

8. KEYWORDS:_____

_____

9. NAMES OF SPECIES:_____

_____

10. DATA TYPE:

[ ] Raw [ ] Other_____

[ ] Reduced_____

[ ] Summarized_____

[ ] Derived (From-By)_____

11. DATA DATE(S) TIME(S):_____

11a. MISSING PERIOD(S):_____

11b. NULL/BAD PERIOD(S):_____

12. CALIBRATION INFORMATION:_____

_____

_____

13. ABSTRACTOR:_____ PHONE:_____

FINAL DECK/FILE RELEASE FOR USE DATE

DATA SET DOCUMENTATION FORM page 2

14. DATA SET NAME:

15. EXPERIMENTAL DESIGN:_____

16. EXPERIMENTAL METHOD:_____

17. SPONSOR: NSF GRANT NUMBER: PROJECT NUMBER:_____

18. DISSEMINATION:

[ ] Not Restricted:_____

[ ] Restricted: To Whom_____ Until_____

19. DATA ABSTRACT:_____

_____

20. SUPPORTING DOCUMENT(S).

21. COMMENTS:_____

DATA SET_____

BCD FORMAT_____

VARIABLES	COLUMNS	FORMAT	UNITS	COMMENTS

DATA_DESCRIP_ CODE *(4 characters)* _____

LIFE_FORM_ASPECT *(Circle One or More Letters)*

A – ABIOTIC B – ANIMALS C – PLANTS D – PROTISTA

ENVIRONMENTAL_ASPECT *(Circle One or More Letters)*

A – AQUATIC B – HYDROLOGY C – LAND–WATER INTERACTION

D – METEOROLOGY E – TERRESTRIAL

ECOLOGICAL_ASPECT *(Circle One or More Letters)*

A – FIRST ORDER CONSUMER B – SECOND ORDER CONSUMER C – THIRD ORDER CONSUMER

D – MINERAL CYCLING E – DECOMPOSITION F – PRIMARY PRODUCTION

G – SECONDARY PRODUCTION H – ABIOTIC

DATA_TYPE *(Circle One or More Letters)*

A – EXPERIMENTAL B – MODELLING C – SURVEY D – SYNTHESIS

KEYWORDS _____

TAXA _____

_____

EXP_DESIGN _____

_____

EXP_METHODS _____

_____

DATA_DOCUMENTATION _____

_____

CROSS_REFERENCE _____

_____

COMMENTS _____

_____

_____

_____

_____

_____

DISSEMINATION *(Circle One)*

A – UNLIMITED DISTRIBUTION

B – LIMITED DISTRIBUTION

C – INVESTIGATOR'S APPROVAL REQUIRED BEFORE DISSEMINATION

NUTIS SEGMENT IDENTIFIERS

FIGURE 2

DATA_SET_NUMBER *(assigned)* _____ TAPE_NUMBER _____

INVESTIGATOR(S) _____

TITLE _____

ABSTRACT _____

LOCATION_CODE *(9 characters)* _____

COUNTRY _____ STATE _____

COUNTY _____ SITE _____

LATITUDE _____ LONGITUDE _____

SPONSOR _____

DATA_DATE _____

ERROR_BOUNDS _____

NUMBER_OF_RECORDS *(80 character records)* _____

DATE COMPILED _____

INITIALS _____

RECORD_LAYOUT

COLUMN NUMBERS	FORMAT DESCRIP.	UNITS OF MEASURE	MNEMONIC	DESCRIPTION OF FIELDS AND CODES
3-7	11-16	21-28	31-38	41-80

EDFB INFORMATION SYSTEM REFERENCES

Brooks, A. A. and R. L. Sayrs. 1972. Documentation and submission of data sets. Oak Ridge National Laboratory, EDFB-IBP 72-6. 33 pp.

Oen, C. J., N. F. Sollins, and D. K. Trubey. 1972. Guide to the generalized bibliographic format for the environmental information system. Oak Ridge National Laboratory, ORNL-EIS-71-3. 36 pp.

Strand, R. H. and D. G. Taylor. 1974. NUTIS: Numerical and Textual Information System, Version 1.0, a user's manual. Oak Ridge National Laboratory, EDFB-IPB 74-10. 27 pp.

Strand, R. H., R. J. Olson, and D. G. Taylor. 1976. NUTIS: Numerical and Textual Information System, Version 1.1, a directory and input manual. Oak Ridge National Laboratory, EDFB-IPB 75/7. 49 pp.

Taylor, D. G. and R. H. Strand. 1975. NUTIS: Numerical and Textual Information System, Version 1.1, a systems manual, Oak Ridge National Laboratory, EDFB-IBP 75-12. 143 pp.